



# IMPLEMENTATION AUGMENTED REALITY IN SENIOR HIGH SCHOOL TO CHALLENGE IN INDUSTRIAL 4.0

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## ABSTRACT

*Senior High School is one of education in indonesia that has important role in the next generation of technology in 2024. This generation must has a qualification in the next technology. Where are in this time, techology will change student how to learn about all subject in the class. This time is indutrial 4.0 as a time the digitalization, augment reality, 3D printing, big data will be use in next education like in the college. So in this section our article will be explained about the important thing some part of industrial 4.0 to challenge the some student to get knowledge in this generation. So the student will be know about the subjects in senior high school and what function of this subject in next profession after they are graduate in this year (2024). So they ready to learn what knowledge that they must qualificate to challange this era. This article will be compared knowledge of technolgy industrial 4.0 about augment reality and another technolgy. So with this article will be know what aspect technolgy that must implement in Senior High School and to be included in the system of education as a subject in Information Technology.*

**Keywords:** industrial 4.0, augment reality

## I. INTRODUCTION

**I**NDUSTRIAL 4.0 is one era that will be used in the next 6 year again from 2019. In this era all technology like digitalization, augment reality or virtual reality, 3D printing, big data, internet of thing will be useful in daily activity of people in all sector area. Education will be use like how to learn universe by use virtual reality and the student will be know about universe with reality by using VR glass or augment reality with the handbook of guide subject the student will be introduced some figure of part of human body using smartphone and application in android system or ios system, so the school will be reduce a cost to buy a figure of human body to presentation about the internal and external body of human system. And with this augment reality the student that has interested how the reality of this part of organ system in the human body, can be print using 3D printing. And all this data will be save in one of sytem in big server that may be has in the next year will be save in the server of ministry of education. So for using this system the student must connect in the internet to get handbook about human body using smartphone to learn about human body as a part of subject in biology. This is the image of description of Industrial 4.0 in education where are the subject of in the school will be manage in some server of big data that has content of big information about content of subject. Augment reality, virtual reality will be remove some high cost in education to presentate with reality figure with the 3D system. This is already explained by [1-3] about industrial 4.0 will be change all sector in industry to internet of things. The industrial 4.0 mus be knownd by student in 2019 so they can imagine what profession and technology will be used in the next future. So they not only using the technolgy but also they has ready to make this technology and interested to learn some subject which they must needed to know deepen this technology. Because the student in Senior High School in 2019 not know about this technology. The student from 17 person only 1 person that has know about technology like augment reality and virtual reality and all student didn't know about subject that must has to know about big data as data science. This is reality of some Senior High School in Blitar.

[2] In this article show about how the previous technology from industrial 1.0 using people as resource, then industrial 2.0 using mechine, then industrial 3.0 using automation to help they job to manage production. All this technology will be leaved in the around 2024, and will be replaced using internet of thing (IOT) as technolgy to

manage the production. As explained in first paragraph about the core system using internet as a centre of business to manage technology like augmented reality, virtual reality, digitalization and big data as part of technology that will be implemented as internet of things. What about difference about education in this era (2019) and next era (2024), may be in Indonesian the sector of information technology to implement in senior high school still not ready in this year (2019), but let's focus on how the technology in this era already changes the process of transferring knowledge from teacher to student. Let's look at applications like Ruangguru, this is the digitalization technology that changes the course system in the educational industry. Previous year, the student only knew to get additional knowledge from school, they only can take a course in another institution like Primagama, Neutron and others. And they must take a lot of energy to go some place of institution and must ready high cost to pay the course and another cost like transportation to go there. But now by using this application like Ruangguru, the student can reduce all cost, energy and can get some information about subject in school more interactive and interesting. Another case the augmented reality already implemented in the tales book for children. With this technology they can look at a reality of condition some role player in tales script by scan position of images in the books. By this technique the children more interesting than only use text and static image. Many of production book of tales has already implemented augmented reality to go the future of book tales. The Senior High School need to know about this technology if the children already know about technology of industrial 4.0. At least know how to use and make augmented reality for support e-learning in the next generation of education. Big data is one of part technology that involved data science to process his data to be information that needed by stakeholder. Like [4-9] the research of processing data in some sector. The student did not know what is a data science, although they already get the subject in the class about data science in mathematic. So by introduce this technology hoped all student can change his mind to deepest knowledge about industrial 4.0 in the next education.

Based on the paragraph one and paragraph two our attention in this article is to know about knowledge of student about technology in industrial 4.0 and try to get information of subject that must qualify to go the future of technology in educational system. So they can ready to challenge the industrial 4.0 when they graduate from college. Many of student in Senior High School don't know about the new technology for supporting the education in this daily school. Many of them, did not know what subject that they must learn when they are go to college, so they can choose the best department in the college when they know the future technology in vacation of job next day when the graduate in that school. With this article hope teacher or lecture can guide they student to change the mindset of learning subjects in school. So they can more interesting to deepest learning about some subject that want to know in industrial 4.0. Our focused in this article is about some subject that make effect with some technology in industrial 4.0 like augmented reality when compared to another technology like virtual reality, 3D printing, big data in student of Senior High School.

## II. METHOD AND REFERENCE

### A. *Augmented Reality*

This technology already used in many aspect of education industry like books of child with interactive 3D modelling using 3D application with unity. Augmented Reality is interactive experience of real-world environment where object that scan from camera will show like already real in the environment. In the game application, already know about Pokemon-Go in recent years ago. That game is combination of real world and virtual world, this make game that only feel in virtual world make sense in the real world. And may be in the future of technology this method will be used in industry like education. The virtual education like virtual teacher or virtual device for supporting in class will be available in the next generation. Laboratory in the recent year need high cost to prepare some equipment and building only for give information to student about the process of chemistry reaction. But in the industrial 4.0 this equipment available in the virtual world but the sense in the real world, the experiment still in the classroom but for the equipment build in the virtual world. This change education in industrial 4.0.

This technology can make by Senior High School student with a low cost. Just only prepare with notebook, laptop and computer with minimum requirement for processor intel core 2 duo, with RAM minimum 4 GB to run android SDK and the software that need for build augment reality application is unity 3D, android visual studio with JDK and SDK installation. And vuforia is supporting software for get marking in some object that will be scanned. The step to prepare making augment reality in unity is :

1. Install unity 3D and register account of unity in <https://unity3d.com/>
2. Register account vuforia
3. Install android visual studio

Look at in figure 1 about image that already make ini unity 3D and scanned with qrcode was prepare using vuforia for get marking.



Figure 1. Augment reality result in 3D unity

In this section student will be introduced how to make augmented reality. The student train to learn how to make it, has a purpose the student know about the process of making augmented reality and not just only as a user.

### B. Unity 3D

Unity is one of software to develop some project 2D, 3D like game, virtual reality and augmented reality. This software already popular with many game programmer because this software already support to build package software in many of platform like android, ios, and television. In augmented reality this software use to help developer to combine marking and 3D object so the this object will show in camera when the marking scanned. In figure 2 show the process making augmented reality using 3D Unity. When try look the diagram the step of AR camera and image target can use after package of vuforia engine already install in 3D unity. Many of student not know about build .apk because this step is difficult installation and need resource of internet higher than a normal condition.

Please look at the step “download 3D object”. In this process student must has some knowledge how to use 3D object and apply them in unity or make 3D object with third party of software development. But the user like student can use 3D object that was available in unity website with free download. The result of develop augmented reality in this software depend on the step create database in vuforia engine to get marking of augmented reality. This process explained in the next section.

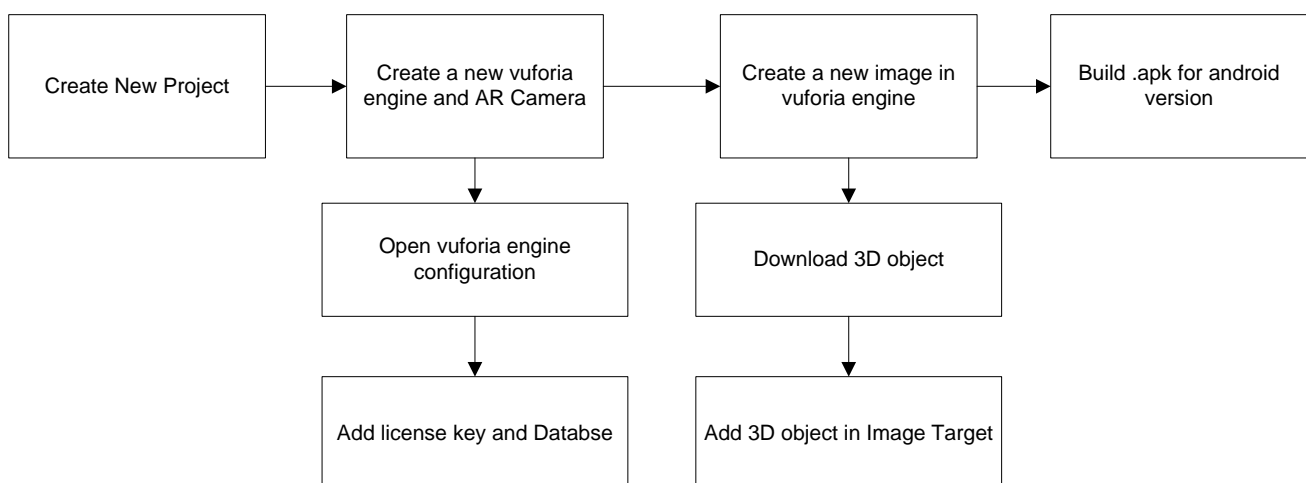


Figure 2. Process making augmented reality in unity 3D

### C. Vuforia

Vuforia is second party of software to develop AR in this article. This process need to prepare about image that will be scanned in camera and apply it in the database AR in unity. In this section student will be recognized to create marking for augmented reality. Marking in this technology can be like qrcode or some part of full image. Look at figure 3, in this image show a full image, but to show augmented reality must place of camera in the correct position. The position is like image in the right position of figure 3.



Figure 3. Full image and marking in augmented reality

Beside using a part of full image augmented reality can used qrcode that famous in developer software. This marking already implement in many product like food, machine, computer, books and others. This code already apply in japan for some years ago to use in vending machine. Many of application in smartphone like bukalapak or others is used to get information by scanned this code. Because this code save some information about text than generate it with the image. Look at figure 4 about qrcode that can be used in augmented reality.



Figure 4. Qrcode for augmented reality

Now, already know about mark in augmented reality. The next step is the process using vuforia for to get marking and process it in unity 3D. Look at figure 5.

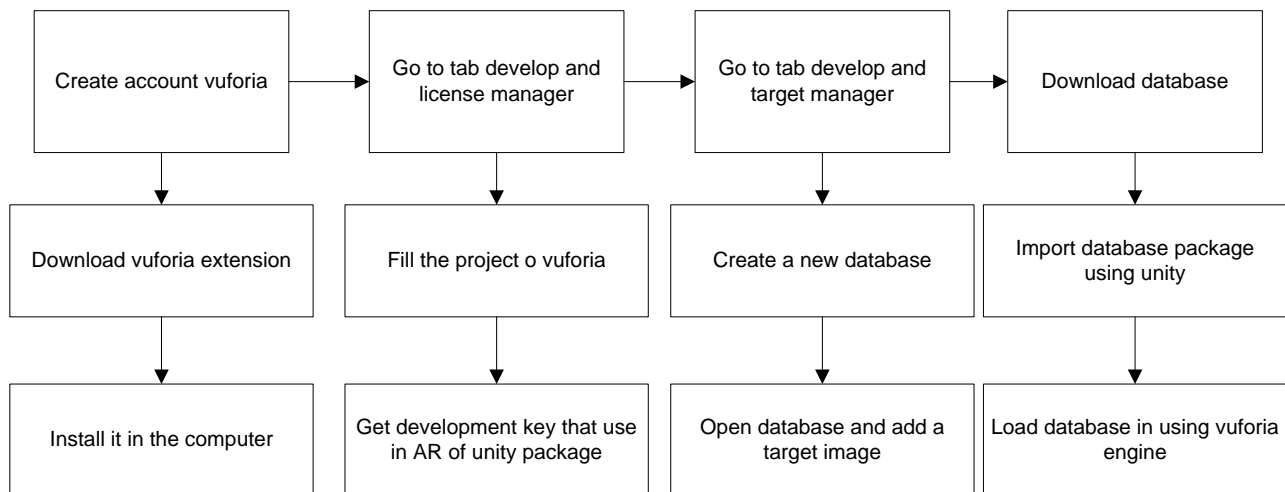


Figure 5. The process to get marking in vuforia

On figure 5 already has some process that must do by student to make marking in vuforia engine and implement them in unity 3D.

#### D. Aspect of Subject in Augmented Reality

This section will be used for getting aspect of subject that must learn by student to make augmented reality in unity 3D. The aspect is used for by this article to get which part must be concerned by teacher or lecture when teaching to student. In this article, only has some aspect that be evaluated for presentation about augmented reality in Senior High School student. So when delivering information in another event can be know what part aspect that must be emphasized by tutor to student, so student can be know about how to make augmented reality more understanding. Look at table 1, about detail aspect that be evaluate in this article for delivering information about AR as technology in industrial 4.0

Table 1. Aspect for delivering information about AR as technology in industrial 4.0

No	Aspect	Detailed Aspect
1.	Augmented Reality Description	<ul style="list-style-type: none"> <li>- Explanation about AR</li> <li>- AR in industrial 4.0</li> </ul>
2.	Installation 3D unity	<ul style="list-style-type: none"> <li>- What is unity and vuforia</li> <li>- Install android visual studio</li> <li>- Install vuforia engine package</li> </ul>
3.	Build project augmented reality	<ul style="list-style-type: none"> <li>- Make marking in vuforia</li> <li>- Applying 3D object in unity</li> </ul>
4.	Making 3D object	<ul style="list-style-type: none"> <li>- What software for making 3D</li> <li>- How to make 3D object</li> </ul>

### III. RESULT AND DISCUSSION

From table 1 we take 17 participant for evaluation about this training using level of understanding of student about the aspect of subject that already explain information about augmented reality in industrial 4.0 in education system. This evaluation will be used by trainer, teacher or lecturer to be basic of the especially aspect must be detailed when deliver information to student. Look at figure 6 about the frequenct of student that understanding about the aspect of subject about augmented reality when trainer give some information to make it. Based on this figure, will be used as basic for trainer to apply them in next training. And will be deliver to student more detailed than before.

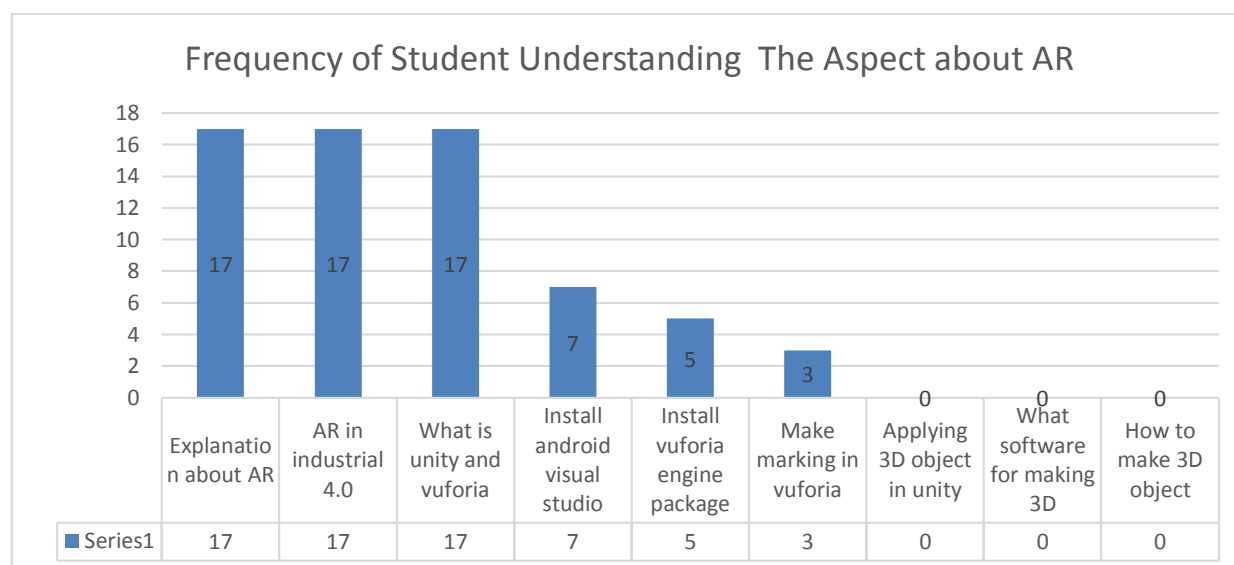


Figure 6. Frequency of student understanding the aspect of AR

In this article we use threshold 13 that show the result of aspect succeeded to deliver information to student. And below of that threshold that indicate the training system for augmented reality still need training again in the next scheduled. This training issue already done in past of days with 17 student participate it. With the long time about 1 hour. Based on the figure 6 the aspect that has threshold below than 13, they are “Install android studio”, “instal vuforia engine”, “make marking in vuforia”, “applying 3D object in unity”, “what software for making 3D” and “how to make 3D object”. Based on this the time will be need to training system about AR in the next scedule about 3 times for explained about AR until student understanding about this topic. The 1st meeting be used to topic of “Augmented Reality Description” and Installation 3D unity”, 2nd meeting for “Build project augmented reality”, 3rd meeting for “Making 3D object”. Based on this times, hoped can be basic framework for trainer to deliver knowledge about AR to student in Senior High School to understand about this topic.

#### IV. CONCLUSION

Based on result and discussion in the previous section. This article has conclusion about the system method to deliver information about AR in Senior High School. That is about time schedule and aspect that must give in every time of the scheduled. The time scheduled divide in 3 times. 1st meeting deliver information about “Augmented Reality Description” and Installation 3D unity”, 2nd meeting about “Build project augmented reality”, 3rd meeting for “Making 3D object”.

#### V. SUGGESTION

Based on this article, the author has purposed to deep observe again to another training like virtual reality, digitalization and big data in the senior high school. That observation will be used for trainer as framework to deliver information about the topic.

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